
Abstract

This chapter discusses the management aspects involved in offering telemedicine sessions. Examples of income and expenditure calculations have been provided with brief financial analysis for the three types of telemedicine services that this DIY guide deals with, namely, teleconsultations, telemonitoring and remote care.

Overview

Although taking a professional approach when considering whether to offer any of the telemedicine services by individual clinicians may feel like to be bit of an overkill, it proves to be wiser in the long run. Nothing can be easier to use a feature or an app already available in one's smart device for telemedicine without much of a forethought. Should one wish to just "remain in touch" using the technology, then this should be sufficient in most cases. However, if one wishes to use it for anything more than just being "with the times", adoption of sound management techniques early on provides more positives than not.

A few management home truths (*the following have been provided without prejudice*):

- All business are run to create wealth, i.e. to be profitable, where income exceeds expenditure. If charitable, all monies lent do not usually have to be repaid, taxes are usually exempted and all profits are ploughed back into the business. If not-for-profit, only the profits are ploughed back into the business, but all interests and taxes have to be paid. If for-profit, the business must make a profit as the shareholders or owners expect to earn from it. So, if the pro forma I & E does not reveal profits, one must not even think about running that line of business.
- Finance ensures one survives till tomorrow. Strategy ensures one survives till next year. Strategic vision is more important than financial gain.

- Short-term financial compromises are okay if they ensure long-term strategic success.
- Free cash flow is the most important thing. Nothing beats cash in hand.
- Yesterday was a dream. Today is a reality. Tomorrow is a hope.
- Administration is proactive, performed by leaders and concerned more with the overall vision, while management is reactive, performed by followers and concerned more with the implementation aspects.
- Plans need to be practical; it isn't good enough if it remains only on paper.
- When booking profits, one must always be ever vigilant against the very human predilection of giving in to greed. One mustn't kill the golden goose that lays golden eggs; instead, one must carefully nurture it.
- Convert every question mark into a star, every star to a cash cow, and suitably handle your dogs to keep competitors out (*refer to BCG matrix components*).
- Discipline in every aspect is of the essence. Lose it and lose the business.
- Assess risk, then take it or forsake it.
- Analyse impact, then do what is best for one's business.

An Important Note

It is possible to create a business model where services are provided on a “no-cost-to-consumer” basis. Tricky, yes, but very much possible. Taking such a decision represents a long-term vision instead of short-term one.

The revenues in such a scenario need to accrue from indirect sources – the so-called “soft” factors. This could be increased customer satisfaction leading to increased goodwill that in turn leads to increased awareness amongst potential customers that finally leads to increased consumer volumes culminating in increased revenues from other services rendered to them representing a healthy return on investment in the medium to long term.

Due to various reasons related to maintenance and upgrades, the “free” model is often found not to be sustainable in the long run. Hence, anyone planning to offer this, for whatever reason, needs to make careful financial assessments first before even thinking of going ahead.

Alternatively, it could also be made a part of the overall care delivery services where the costs incurred and the additional revenues expected from are factored into the care service offering mix. An example of this would be to offer it to every patient either as part of their consultation or inpatient's stay or at a special rate that may be charged specifically for the extra services rendered.

Done properly, it additionally translates into increased consumer volumes, although the increased volume may not be as high as a “free” service as many consumers may balk at the need to pay extra. Also, creating a mechanism where some consumers use the premium service that aids in the delivery of better care and contribute positively to better outcomes, while the rest who opt not to but suffer as a consequence may lead to avoidable frictions within the system that may be detrimental to the business overall. Doves of aggrieved consumers are worse than a wake of vultures feeding on a not-yet-dead animal, and that scenario can definitely never be good for business.

Business Model

A business model is the way in which a company expects to generate revenue and make profit from company operations. A good business model will ensure that the business is an overall success in terms of revenues, profits, further investments and growth, thereby making it a reasonably acceptable risk to go into – both for the investor and the business sponsor/owner alike.

Business Case

Let us assume that a clinician observes that offering telemedicine services to patients under his care would be useful for his practice. He needs to first decide what services all to offer. This would generally be based on his interactions with his patients and staff. Once he decides to offer either one or several different types of services, he needs to figure out whether he needs to set up a company to do that or extend the service offerings of his existing practice. In case of the former, he would need to have a business plan and in the latter a business case prepared to help convince his investors (usually the dear old and hopefully cooperative bank manager) to cough up the necessary dough required to fund it.

For example, while a hospital would perhaps be interested to provide teleconsultation or telemonitoring and hence will prepare a business case to support it, a clinician will need to prepare a business plan. For remote care, it would more often be the case that a business plan would be required since such specialised services can only best be offered by a new company.

In either case, the output document is principally for the investors or creditors (financers, banks and sundry lenders).

One needs to make a cool and calculated decision that one wants to offer a particular set of telemedicine services. One must then collect sufficient justification for that decision before deciding on the range of services that one plans to offer. Only then should one go ahead and take the plunge. The following questions help in the process.

1. What's in it for me?
2. How will it benefit me and my business?
3. What all tools are required for this?
4. Where can I source them from?
5. How much will it cost to set everything up?
6. Who all can help me?
7. Do I need a place to run it from? If yes, where should I locate it? Why that particular place? How do I acquire, fund and run it?
8. What all changes do I need to make in my current business in terms of
 - (a) Infrastructure
 - (b) Personnel
 - (c) Work processes

The business case/plan document is for the proposer (of the business) representing his strategic vision. Its aim is to provide sufficient guidance to him on his journey towards meeting his business objectives – the reason for him taking the plunge instead of investing in the money market and relax as he watches his money grow.

The target audience for the document however are the investors or creditors (financers, banks and sundry lenders) representing the financial aspects of the business – how much it will cost, how much profit is expected, etc. – all supported with facts, figures, analysis, reports, charts and graphs. Its aim is to provide sufficient evidence for the lenders to have confidence in the business venture.

Profit and loss is calculating profit or loss that is expected from the business and the projections are usually made for either 3 or 5 years. All are best-guess estimates (aka best guess-estimates) since these are projections. It is wise to have two estimates of both the volumes and the revenues – optimistic (high) and pessimistic (low) – to figure out whether it is wiser to invest in or mark it as a “no go” based on the financial assessments. One must also always be mindful of the value of “goodwill”. This intangible item proves to be a key success factor of any business venture quite often.

Usually a business case/plan will generally be expected to have the following sections.¹ Suffice it to say, its preparation is best left to experienced professionals, and the cost incurred thereof is money well spent.

- Executive summary
- Introduction and overview
- Current market analysis (with gaps identified)
- Cost-benefit analysis
- Options evaluation
- Key assumptions and dependencies
- Risk and sensitivity analysis
- Resource requirements and cost
- Pro forma income and expenditure statement (3 or 5 year² projection with NPV and IRR calculation – mention the WACC/interest (hurdle) rate considered)
- Project timelines (estimated)
- Conclusions
- Recommendations

¹List inspired by a Business Case Template made available by National Innovation Centre, NHS, UK

²Although 5 years is the norm, for all projects that are IT-related or have a heavy IT component, it is wiser to have a 3 year projection to factor in the rapid changes in the underlying technologies that might impact the project by rendering existing systems (both hardware and software) obsolete.

Costing Telemedicine Services

Being a service, the various components need to include the “human” factors like goodwill of the person/persons performing the service, cost of their training (including retraining), salary/consultation fees to be paid, etc. The time taken to provide the service, connection charges, etc. needs to be calculated also. Although paid periodically, they behave as fixed costs for all effective purposes as they generally tend to remain the same. Furthermore, being a service, it has no inventories. This is both a good thing and a bad thing: good, because no inventory carrying costs are incurred; bad, because the services cannot be stored for future use and need to be produced at the time of consumption. When there is no sale, there is no revenue, and periods without sale, which in this case is equivalent to non-utilisation, are lean periods where the fixed costs remain unrecovered.

Analysis

Costing of telemedicine services is, as with most costing exercises, not simple. The various costs of goods sold components of services consist broadly of the equipment used for delivering the services and the human resources utilised to providing them.

Cost Heads

These are the various groupings of cost-incurring items. For telemedicine services, these would be as follows:

1. Fixed
 - (a) Equipment
 - Hardware – requires servicing and replacement, but IT-related ones can be depreciated at a faster rate
 - Software – requires periodically recurring licensing fees, upgrading and maintenance
 - (b) Salary paid to service providers who are full-time employees (FTE)
 - (c) Cost of training and retraining personnel
 - (d) Office furniture
2. Variable
 - (a) Running costs
 - Electricity consumed
 - Office rental
 - Office supplies
 - Others
 - (b) Cost of goods sold (COGS) – *aka cost of services delivered*
 - Telecommunication connectivity costs

- Consultant costs (for teleconsultations only) – paid either on the number of consultations or number of hours or per diem basis
- Salary paid to contractual workers who typically are paid on an hourly basis for the number of hours actually worked

Cost Drivers

These drive the incurred costs.

Since there are no inventories in services, the cost drivers applicable to telemedicine services are as follows:

1. Number of teleconsultations/telemonitoring sessions undertaken or remote care subscribers
2. Amount of time spent in providing the consultations
3. Length of idle time (*period of no activity*)
4. Length of downtime (*due to any factor*)
5. Turnaround time (TAT) between two sessions

Activity-based costing method is the best. When there is no service to be provided, the variable costs are not incurred. The amount of time spent in providing the services and the idle/downtime are the principle cost drivers.

While the number of sessions is also a cost driver, the length of time taken to perform such consultations and TAT can vary. It will also be necessary to ensure zero or near-zero downtime (six sigma approach would be a good practice to follow) and cut down on idle time to ensure optimal performance.

Although when marginal costs match marginal prices, profit maximisation occurs, it must be noted that whenever the load factor for service delivery exceeds 80%, the service quality usually suffers more often than not. This almost invariably leads to negatively impacting the company's top line and loss of that all-important "goodwill".

Pricing Telemedicine Services

Pricing services is a tricky business. Services are quite unique in nature as they are rendered and tend to be much individualised. They have no shelf-life and they cannot be put into any inventory. They are delivered by a person or a group thereof to a person or a group thereof. So, at what price point is it "just about right" and not become too much? What is the threshold for too little? Should one have a fixed price for all or a flexible one where different rates are offered to different customers based on negotiations with them? These are amongst the many imponderables when deciding prices.

Several pricing methods can be used to price products.³ These are cost oriented like cost plus pricing, markup pricing, break-even pricing, target return pricing and early cash recovery pricing or market oriented like perceived value pricing, going-rate pricing (are of two types, namely, competitor's 'parity' pricing and premium pricing), discount pricing, sealed-bid pricing and differentiated pricing (that are of four distinctive types, namely, customer segment pricing, time pricing, area pricing and product form pricing).

Cost plus markup or break-even pricing method is an easy method to adopt and works decently enough for telemedicine services with the former returning a profit on every session while the latter ensuring that there is no loss (pricing is supposed to guarantee a no-profit-no-loss).

To price telemedicine services, it is necessary to decide first what the aim of providing it in the first place is. Is it to benefit the consumers? Is it to benefit the providers? Is it for a bit of both? Since profit maximisation occurs when marginal income = marginal cost, should one try and aim for that? Is that morally defensible in healthcare that has a very strong social aspect to it?

A wise way to go about this would be to consider how much it costs to render the service in the first place and then add a "reasonable markup" in order to book the desired profits. This "reasonable" markup is the trickiest bit by far. If there are no competitors, it is possible to get away with a huge number, else one may have to opt for a break-even pricing where only the costs are recovered. Goodwill is an important consideration too for any pricing decision.

The price sensitiveness of the customers and their ability to pay is also an important factor that needs careful consideration. If they are unable to pay the charges, they will not opt for the service in the first place, which results in rendering the entire business model unviable from the very beginning. This feature results in customers balking at any charge they consider to be overpriced. Estimating the demand for services is a good measure to figure out which price is right.

Normally, patients would prefer telemedicine to be available as a free service. Thus, including it as part of an overall package may be wiser and accordingly charged or not. For example, there is a charge for every consultation. If that is charged irrespective of whether it was "in person" or "from a distance", then there should not be much of a problem and the patients accepting it with the least amount of fuss.

Do note that most insurance companies will not defray charges for receiving telemedicine services, although this has begun to change of late.

For remote care, it is wiser to bundle all charges together as a package deal since it includes remote monitoring, teleconsultations and attending in person that cannot be properly segregated as these are rendered on a continuous basis as part of the overall service.

³ Methods of Pricing: Cost-Oriented Method and Market-Oriented Method by Smriti Chand (www.yourarticlelibrary.com/marketing/pricing/methods-of-pricing-cost-oriented-method-and-market-oriented-method/32311/)

Pro forma I & E

This is a financial statement that summarises the revenues earned and the different costs and expenses incurred. *Do note that it is a part of financial management and represents a projection, i.e. a forecast, and does not reflect actual numbers, which is part of accounting.*

The various account heads for calculating this are typically as follows.

Earnings

Usually, this is

$$\text{unit price} \times \text{sales volume}$$

In a healthcare delivery services setting, it will be

$$\text{price of all services rendered} \times \text{total number of patients served}$$

and

$$\begin{aligned} &\text{price of all products (investigation, medications, etc.)} \times \\ &\text{total number of items sold (tests performed, medication dispensed, etc.)} \end{aligned}$$

COGS

Aka cost of sales (of services)

Cost of goods sold is the set of direct costs that are incurred during the course of producing the goods (or services) that are eventually sold by a company. This amount includes the cost of all the different materials used to create the goods along with the direct labour costs used to produce them.

To calculate the cost of telemedicine services rendered, one must remember to include the various staff salaries, establishment costs in terms of rent, electricity, water and connectivity costs (could be fixed or per use or a mixture of these two).

EBIT

Earnings before interests and taxes represents how much the business has earned before paying whatever that is compulsorily owed in terms of interests and taxes. It is a measure of how good the management is doing from a business perspective and represents the “true” profits and helps answer such questions as follows: Are the sales efforts satisfactory? Are the products (services) priced correctly, i.e. the paying customers neither are being overcharged nor undercharged? Are the costs under control?

EAT

Earnings after taxes, aka NI or net income, are the “true” income of the business. Do note that the more the better is not always a good thing for it could mean that the management is merely being able to exploit favourable conditions that may or may not last for long.

Cash Flow Analysis

This is a little tricky and requires some degree of understanding the various principles involved plus considerable amounts of practise.

A business is considered to be doing great when it is able to make more cash available to itself as reflected in the account books as “cash in hand” (usually in the bank as liquid cash but free from any liabilities and available for immediate withdrawal). It is worth noting here that this includes cash that is owed to others but is lying with the business due to its accounts payable (this should be as high as possible) and also early payment of sums owed to it by others, i.e. its accounts receivable (this should be as low as possible). It is also necessary to add back all depreciation values since they only represent a bookable expenditure permitted under income tax rules and no actual cash outflow takes place (represents “free air”).

NPV

Net present value is the value of the total investment (present value of the estimated cash inflows minus the present value of the estimated cash outflows) as on current date calculated at the current rate of inflation (or WACC). This index is helpful to figure out whether it is worthwhile to make the investment, i.e. assess financial risk of a business as on today. By suitably tweaking the various items, like capital and operational expenditures, and rejigging the income, it is possible to figure out at what point the business may be made viable, if not worthwhile. This “tweaking” should however be done with great care since too much of this is a sure recipe for disaster.

Examples

Special Note: the following examples have been provided purely for illustrative purposes and are meant to demonstrate the attractiveness, or not, of a particular offering. These must in no way to be taken as indicative in any manner or form. It must also be noted that the various costs (capex and opex), volumes and levied charges have been calculated using very realistic figures as prevailing in India in April 2017.

Readers will additionally take note that the currency used is Indian Rupees (₹) and are in multiples of thousands (000 s). For reference purposes, in April 2017 the prevailing conversion rate was USD (\$) 1.00 = ~INR (₹) 65.00 (i.e. one US dollar was equal to around sixty-five Indian rupees) or in other words, ₹ 1.00 = ~\$ 0.015 (one Indian rupee was equivalent to roughly one and a half US cents).

Teleconsultation

It is assumed that the clinician (or hospital) providing the services will maintain both the patient's and clinician's ends as well as any connectivity costs between the two.

High End: Utilises the Best-of-Breed Equipments

Assumptions

1. Establishment costs:
 - (a) Room rent
 - (b) Power supply
 - (c) Network connectivity
 - (d) Air-conditioning
 - (e) Lighting
2. Equipments required:
 - (a) Both clinician's and patient's ends:
 - Video equipment:
 - High-end camera
 - Ultra HD LED TV screen 50"+
 - Audio equipment:
 - Multidirectional wireless microphone
 - Speakers
 - Furniture – chairs
 - (b) Clinician's end:
 - Cloud-based EHR system with electronic prescription module or CPOE integrated with the EMR component – the cost related to this item is expected to be charged on a fixed monthly basis and considered along with the room rent, power supply and network connectivity costs
 - Monitors:
 - Video display screen
 - Image display – DICOM viewer
 - Furniture – tables (for equipments)
 - (c) Patient's end:
 - Medical devices
 - Medical scanning equipment – to be used by non-clinical staff who are guided by the remotely located consultant
 - Medical monitors
 - Furniture – table (for positioning/examining patients)

3. Resources:
 - (a) Video cameraman
 - (b) Audio handler
 - (c) Consultant (clinician's end)
 - (d) Nurse/technician (patient's end)
4. All costs to be incurred by the facility providing telemedicine consultation, roughly comes to:
 - (a) Capex = ₹ 3,000,000.00
 - (b) Opex = ₹ 1,200,000.00 per annum
 - (c) Leased line costs = ₹ 2,000,000.00 per annum
 - (d) Consultant fee (payable per encounter) = ₹ 1,000.00
5. Teleconsultation charges = ₹ 3,500.00 per encounter, irrespective of duration, charge rising by 10% yearly from Year 2
6. Expected number of consultations:
 - (a) First year = 75 per month (roughly translates to 3 encounters per working day of each week)
 - (b) Yearly growth:
 - Second year of operations = 100%
 - Third year of operations = 50%
 - Fourth year of operations = 25%
 - Year-on-year growth from fifth year of operations = 20%
7. Opex costs to rise 10% year on year
8. AMC = 10% of Capex per year
9. Depreciation = 20% per year, no replacements have been considered within the 5 year calculation period
10. Applicable income tax rate (consolidated) = 33%:
 - (a) No tax to be paid if losses are booked for the applicable year.
 - (b) No losses are carried over to the following year.
11. Applicable WACC (cost of borrowing) = 6.25% (prevailing rate of interest April 2017) (Table 10.1).

Low End

Assumptions

1. Establishment Costs:
 - (a) Room rent
 - (b) Power supply
 - (c) Network connectivity
 - (d) Air-conditioning
 - (e) Lighting
2. Equipments required:
 - (a) Both clinician's and patient's ends:
 - Laptops – high end
 - Video equipment

Table 10.1 Pro forma I & E for teleconsultation (high end)

Teleconsultation						
All figures ₹ 000's	Year 0	Year 1	Year 2	Year 3	Year 4	Year 5
Volume calculations		900	1800	2700	3375	4050
Charges (per teleconsultation session)		3.5	3.85	4.235	4.6585	5.12435
Salary costs		(1200)	(1320)	(1452)	(1597)	(1757)
Consultants fees		(1)	(1)	(1)	(1)	(1)
Total consultants fees		(900)	(1980)	(3267)	(4492)	(5930)
Yearly room rent, power, connectivity, EHR costs		(3200)	(3520)	(3872)	(4259)	(4685)
<i>I & E statement</i>						
Income	0	3150	6930	11,435	15,722	20,754
Loans (for capital expenditures)	(3000)	0	0	0	0	0
COGS	0	(5600)	(7120)	(8891)	(10,649)	(12,672)
Depreciation	0	(600)	(600)	(600)	(600)	(600)
EBIT	0	(3050)	(790)	1944	4474	7482
Interest costs	0	(538)	(633)	(743)	(853)	(979)
Payable IT	0	0	0	(396)	(1195)	(2146)
EAT	0	(3588)	(1423)	804	2426	4357
Free cash flow	(3000)	(2988)	(822)	1404	3026	4957
NPV @ 6.25%	626					
IRR	9%					

- Inbuilt web camera
 - Large display screen attached to laptop display
 - Furniture – chairs
- (b) Clinician's end:
- Audio equipment:
 - Lapel microphone
 - Headphones
 - Cloud-based EHR system with electronic prescription module or CPOE integrated with the EMR component – the cost related to this item is expected to be charged on a fixed monthly basis and considered along with the room rent, power supply and network connectivity costs
 - Furniture – tables (for equipments)
- (c) Patient's end:
- Audio equipment:
 - Multidirectional microphone – attached to laptop
 - Speakers – attached to laptop
 - Medical devices, only portable scanning machines used, if at all
 - Medical monitors
 - Furniture – table (for positioning/examining patients)
3. Resources:
- (a) Consultant (clinician's end)
- (b) Nurse/technician (patient's end)

4. All costs to be incurred by the facility providing telemedicine consultation, roughly comes to:
 - (a) Capex = ₹ 2,000,000.00
 - (b) Opex = ₹ 600,000.00 per annum (includes connectivity costs)
 - (c) Consultant fee (payable per encounter) = ₹ 1,000.00
5. Teleconsultation charges = ₹ 2,500.00 per encounter, irrespective of duration, charge rising by 10% yearly from Year 2.
6. Expected number of consultations:
 - (a) First year = 50 per month (roughly translates to two encounters per working day of each week)
 - (b) Yearly growth:
 - Second year of operations = 100%
 - Third year of operations = 50%
 - Fourth year of operations = 25%
 - Year-on-year growth from fifth year of operations = 20%
7. Opex costs to rise 10% year on year.
8. AMC = 10% of Capex per year.
9. Depreciation = 20% per year, no replacements have been considered within the 5 year calculation period.
10. Applicable income tax rate (consolidated) = 33%:
 - (a) No tax to be paid if losses are booked for the applicable year.
 - (b) No losses are carried over to the following year.
11. Applicable WACC (cost of borrowing) = 6.25% (prevailing rate of interest April 2017).
12. EMI costs have not been considered when calculating free cash flows (Table 10.2).

Discussion and Analysis

In case of high-end teleconsultations, although the NPV⁴ is acceptable (as is the IRR⁵), the main problems lie in the need to have high number of cases from the very first day of operation, which may be very ambitious in itself, with the requirement for high capital expenditures being an additional cause for concern.

The figures for low-end teleconsultations do not appear to make any exciting news either. The continued need to have a high number of cases from day one and keep on charging them a high fee remains a matter of concern, although the requirements of capital expenditures (capex) are much more manageable.

All in all, teleconsultation faces challenges from high capex and high volume requirements from the very first day of operations. Since not all patients will require teleconsultation and many would be put off by the charges, which may be several times of a physical face-to-face consultation, coupled with the need for patients to still travel, the target volumes will continue to present significant challenges on a continued basis.

⁴Net present value

⁵Internal rate of return

Table 10.2 Pro forma I & E example for teleconsultation (low end)

Teleconsultation						
All figures ₹ 000's	Year 0	Year 1	Year 2	Year 3	Year 4	Year 5
Volume calculations		600	1200	1800	2250	2700
Charges (per teleconsultation session)		2.5	2.75	3.025	3.3275	3.66025
Salary costs		(600)	(660)	(726)	(799)	(878)
Consultants fees		(1)	(1)	(1)	(1)	(1)
Total consultants fees		(600)	(1320)	(2178)	(2995)	(3953)
Yearly room rent, power, connectivity, EHR costs		(1200)	(1320)	(1452)	(1597)	(1757)
<i>I & E statement</i>						
Income	0	1500	3300	5445	7487	9883
Loans (for Capital Expenditures)	(1000)	0	0	0	0	0
COGS	0	(2500)	(3400)	(4456)	(5491)	(6688)
Depreciation	0	(200)	(200)	(200)	(200)	(200)
EBIT	0	(1200)	(300)	789	1796	2994
Interest costs	0	(219)	(275)	(341)	(406)	(481)
Payable IT	0	0	0	(148)	(459)	(830)
EAT	0	(1419)	(575)	300	932	1684
Free cash flow	(1000)	(1219)	(375)	500	1132	1884
NPV @ 6.25%	204					
IRR	9%					

Telemonitoring

Assumptions

1. Telemonitoring service is provided to all admitted patients once a day in a 75-bedded facility with around 80% occupancy; this translates into a total of $75 \times 0.8 \times 365 = 21,900$ telemonitoring sessions rendered per year.
2. Telemonitoring is charged @ ₹25.00 per session.
3. All devices, scanners, etc., already are networking ready, which means that they can be connected via a gateway to the Internet; where monitors and other devices cannot telemeter their data (streaming and non-streaming) through to the remotely located clinician, the data will be entered into a Cloud-based EHR; alternatively, the monitors can be viewed directly by appropriately placing the video cameras or using far-end camera control (wherever possible).
4. No extra resources required specific to telemonitoring.
5. Cloud-based EHR system already in use by the institutions will be used for every admitted patient.
6. Telemonitoring-specific equipment required – facility end.

- (a) Laptop or tablet or smartphone that has video chatting or telepresence software installed with suitably located inbuilt video camera(s) and microphone with speakers; the laptops can be placed on mobile trolleys (with castors) and turned around to face towards or away from the patient or towards a specific area or monitor or nursing and paramedical staff as necessary; wherever possible far-end camera control can be used as necessary by the clinician.
 - (b) Furniture to house far-end camera control-enabled audio-visual unit with castors (nursing trolleys are usually sufficient enough) so that they can be moved about to permit the clinician to view the patient from various sides.
7. Telemonitoring-specific equipment required – clinician’s end; it is expected that the modern-day clinician will already be having the following equipment and *will not be incurring extra costs specifically due to telemonitoring*:
 - (a) Display monitors attached to laptops with HD web camera
 - (b) Lapel microphone – can be used in tablet/smartphone if so required (this can be a microphone and earphone combo)
 - (c) Stereophonic noise-cancellation headphone or earphone – can be used in tablet/smartphone if so required (this can be a microphone and earphone combo)
 - (d) Tablet/smartphone with HD camera – both front and rear
 - (e) Printer – Wi-Fi networked colour inkjet/laser
 8. Opex costs to rise 10% year on year.
 9. AMC = 10% of Capex per year.
 10. Depreciation = 20% per year, no replacements have been considered within the 5 year calculation period.
 11. Applicable income tax rate (consolidated) = 33%:
 - (a) No tax to be paid if losses are booked for the applicable year.
 - (b) No losses are carried over to the following year.
 12. Applicable WACC (cost of borrowing) = 6.25% (prevailing rate of interest April 2017).
 13. There are no EMI costs incurred for any item.
 14. Telemonitoring fee to be charged on a per-patient basis, rising at 10% yearly from Year 2 onwards (Table 10.3).

Discussion and Analysis

Looking at the figures above, it is pretty mindboggling that no one has yet considered this aspect of telemedicine seriously. Even by charging ₹ 25.00 (Rupees twenty five only!) as one-time fee on admission, telemonitoring can be provided at a profit from the first year of operations itself. This is a story in itself for sure.

Quite frankly, the facility can choose to offer this service at no cost to the patient and consider all costs incurred specifically due to telemonitoring as sunk costs. The goodwill generated will surely be worth more than what money can buy.

Table 10.3 Pro Forma I&E example for telemonitoring

Telemonitoring						
All figures ₹ 000's	Year 0	Year 1	Year 2	Year 3	Year 4	Year 5
Volume calculations		21900	21900	21900	21900	21900
Charges (telemonitoring for entire inpatients stay – admission to discharge)		0.025	0.028	0.030	0.033	0.037
<i>I & E statement</i>						
Income	0	548	602	662	729	802
Loans (for capital expenditures)	(150)	0	0	0	0	0
COGS	0	(65)	(65)	(65)	(65)	(65)
Depreciation	0	(30)	(30)	(30)	(30)	(30)
EBIT	0	453	507	567	634	707
Interest costs	0	(13)	(13)	(13)	(13)	(13)
Payable IT	0	(145)	(163)	(183)	(205)	(229)
EAT	0	294	331	371	416	464
Free cash flow	(150)	324	361	401	446	494
NPV @ 6.25%	1434					
IRR	226%					

Remote Care

Assumptions

1. Subscription-based model – all marketing- and sales-related costs are sunk costs.
2. Starting off with 100 subscribers in the first month of operations, the service provider adds 100 more every month during the entire 5-year period.
3. All costs incurred at the patient's end to be paid for at cost by the patient and hence not considered.
4. Remote clinician establishment costs:
 - (a) Room rent
 - (b) Power supply
 - (c) Network connectivity
 - (d) Air-conditioning
 - (e) Lighting
5. Equipment required at the clinician's end:
 - (a) Furniture
 - Table to house all the equipment
 - Chairs for monitoring personnel
 - (b) Monitors – HD computer screens
 - (c) Laptop with HD camera, microphone and speakers
 - (d) Health portal
 - (e) EHR system
6. Remote monitoring system – specially designed and developed for the facility, hosted in the Cloud:

- (a) Cloud hosting costs – paid all upfront annually.
 - (b) Remote monitoring software – this will collect data from remotely located persons and run data analytics on it to raise automated alerts and warnings for providers as well as monitored persons for further actions and interventions to be initiated as necessary. *This is expected to be custom-built for the service provider and will be Cloud hosted. Needless to say, this is expected to be the single-most expensive piece of equipment used to provide remote care service.*
7. Resources:
- (a) Remote care monitoring personnel
 - (b) Care provider (nurse, community nurse, paramedics or health worker) for contacting patient including home visits – one care provider for every ten subscribers
8. Opex costs to rise 10% year on year.
9. AMC = 10% of Capex per year.
10. Depreciation = 20% per year (no replacements have been considered within the 5 year calculation period).
11. Applicable income tax rate (consolidated) = 33%:
- (a) No tax to be paid if losses are booked for the applicable year.
 - (b) No losses are carried over to the following year.
12. Applicable WACC (cost of borrowing) = 6.25% (prevailing rate of interest April 2017).
13. There are no EMI costs incurred for any item (Table 10.4).

Discussion and Analysis

Nota Bene: *Considering that with estimates of around 47% of 323 million people in India are senior with at least one chronic disease⁶, a remote clinician organisation can reasonably expect to generate sufficient sales (both volumes and income-wise). Consequently, the figures mentioned in the calculations above are not all that unrealistic.*

The financial calculations above, although illustrative, do appear to point towards the reasonable viability of a remote care project that is offered at very modest charges (₹ 3,000.00 i.e. Rupees three thousand only per month) and adding only 100 new subscribers to existing ones every month. This latter figure can certainly be made much higher and should be strived for. *Quite honestly, at such ridiculous low charges and for the benefits offered, 24 × 7 tracking, immediate feedback regarding missed medications or need to get an investigation done or go visit a facility, proactive home visit by a qualified clinician (usually a nurse or a paramedic), etc., if the marketing and sales department are unable to add a whole lot more, they should be changed forthwith by a more competent group of people.*

The financials above are impressive enough, even though illustrative, for investors to take a serious look at this line of business, for this is surely going to play a significant part in the healthcare monitoring and delivery services in the months and years ahead.

⁶<http://www.prb.org/Publications/Reports/2012/india-older-population.aspx>

Table 10.4 Pro forma I & E example for remote care

Remote care						
All figures ₹ 000's	Year 0	Year 1	Year 2	Year 3	Year 4	Year 5
Total number of subscribers at the end of the applicable year		1200	2400	3600	4800	6000
Charges (per month)		3	3.3	3.63	3.99	4.39
Remote care personnel salary, room rent, power, connectivity and cloud hosting costs		(14,475)	(15,923)	(17,515)	(19,266)	(21,193)
Clinician (non-clinician) salary		(20)	(22)	(24)	(27)	(29)
Total clinician payment		(15600)	(48,840)	(88,572)	(1,35,762)	(1,91,504)
<i>I & E statement</i>						
Income	0	23,400	73,260	1,32,858	2,03,643	2,87,256
Loans (for capital expenditures)	(51000)	0	0	0	0	0
COGS	0	(35,175)	(69,863)	(1,11,187)	(1,60,128)	(2,17,797)
Depreciation	0	(10,200)	(10,200)	(10,200)	(10,200)	(10,200)
EBIT	0	(21,975)	(6803)	11,471	33,315	59,259
Interest costs	0	(4561)	(3613)	(2471)	(1105)	516
Payable IT	0	0	0	(2970)	(10,629)	(19,726)
EAT	0	(26,536)	(10,415)	6030	21,580	40,050
Free cash flow	(51000)	(16,336)	(215)	16,230	31,780	50,250
NPV @ 6.25%	8482					
IRR	10%					

Change Management

[Much of the following material is based on the basic principles of clinical transformation as propounded by Perot Systems and promoted by HIMSS.⁷]

The Greek philosopher Heraclitus believed that perpetual change is the natural law by which the universe operates.⁸ He never claimed that change would be pleasant or that anyone would be eager to embrace it. In fact, change is inherently stressful, a precarious balance between harmony and discord between what's comfortable and what's risky. Heraclitus' perspectives on change, formulated 2500 years ago, uncannily presage the efforts of today's business enterprises to respond to the challenges of changing their business models and relationships.

⁷Health Information and Management Systems Society

⁸http://mthink.com/legacy/www.hctproject.com/content/white_papers/HCT1_wp_friedman.htm

Healthcare providers are especially aware of the need to implement key changes in the way healthcare is delivered, to provide safer, more cost-effective care to their patients. They have also learned, occasionally through painful experiences, that a purely technical solution — putting laptops in every hospital room, for example — does little to improve the quality and safety of patient care.⁹

The readers will do well to note that whenever telemedicine is introduced, there will be an inevitable impact on the various business processes running at that time. The impact levels can be from minimal to totally disruptive. So, change management assumes enormous importance. For this, the first step is to perform a business impact analysis followed by a business process re-engineering.

Any change management requires paying attention to people, process and technology in equal degrees. Just concentrating on technology is a major mistake and has led to IT implementation failures in healthcare far too frequently for anybody's comfort. Recognising the need to handle the technological aspects is easy. The need to handle people and processes is not much.

From both organisational and people perspective, any change is a significant disruption. The hitherto usual way of working is supplanted by an entirely new way. The good part about telemedicine is that the impact of its introduction is varied. Where only teleconsultations are being done from a specially dedicated room, the effect is minimal. When the full range of telemonitoring is introduced in both the wards and individual rooms, the effect is maximal.

It is wiser to get the people whose way of working is going to be impacted fully on board from day 1. Ramming it down the throat by presenting it as some sort of a *fait accompli* is a very bad idea and should never be done – it almost guarantees hostility and usually results in total failure making it a non-starter from very first day of the project.

Incidentally, the most sceptical people usually turn out to be the most ardent supporters once their fears are allayed, and concerns are addressed satisfactorily. Regular training, letting them help set up the equipment and using for practice runs are all great methods to not only prepare them for the upcoming change but also make them comfortable using the various instruments in a less stressful manner.

Necessary changes in the existing processes need to be taken care of too. The existing processes will need careful evaluation as they will need to undergo none to minimal to maximal changes. Some may need to be entirely scrapped while introducing new ones. Depending on the amount of changes, investing in a qualified change management expert with proven track record will turn out to be a wise choice.

Certain guiding principles to manage the overall change are as follows:

- Reframing the organisational culture
- Creating improvement capability
- Collaborating across teams
- Taking evidence-based decisions
- Driving results and benefits
- Maintaining constancy and ongoing focus
- Allocating resources appropriately and wisely

⁹mthink.com/legacy/www.hctproject.com/content/white_papers/HCT1_wp_friedman.htm

Diffusion of Innovation¹⁰

The application of telemedicine technology as a whole is not really innovative anymore. Neither is teleconsultation nor telepresence nor robotics. Telemonitoring and remote care, perhaps. Yet, it has largely not been as common place as it ought to have. This is somewhat bewildering. Therefore, it is worthwhile to try and understand the reasons for the things having to come to such a pass.

The answer is multifactorial – not the right solution for a given situation, pricing not right, things not going according to plan, people not convinced of its effectiveness, etc. The list is large.

Perhaps the most important reason is the lack of conviction amongst the stakeholders in terms of doctors, nurses, patients and payers that this technology actually makes a difference. This could be a consequence of not having or using the most appropriate solution for a particular situation.

Not everyone will benefit from teleconsultation using telepresence and far-end camera control – it is neither necessary nor indeed does it work in every encounter. Robotic surgery is not necessary for every surgical procedure. Therefore, some other innovative telemedicine technology solutions are required to be used to help address the various healthcare delivery-related issues of the day.

The challenge that continues to remain is in ensuring the success of these innovations in terms of widespread acceptance and use. For this, it is important to try and understand as to how the various stakeholders can be convinced to join the bandwagon in large numbers. The answer lies in knowing how any innovation becomes popular.

In his “Diffusion of Innovations” in 1995, Everett Rogers argued that “diffusion is the process by which an innovation is communicated through certain channels over time among the members of a social system”.¹¹

Innovation is defined as “an idea, practice, or object that is perceived to be new by an individual or other unit of adoption”.

Communication is defined as “a process by which participants create and share information with one another to reach a mutual understanding”.

The phrase “Diffusion of innovation” itself is defined as “the process by which an innovation is communicated over a period of time among the members of a social system”.

Rogers states that the innovation itself occurs in four stages as under:

1. Invention
2. Diffusion (or communication) through the social system
3. Time
4. Consequences

¹⁰ www.peecworks.org/PEEC/PEEC_Gen/I01795F8D; www.d.umn.edu/~lrochfor/ireland/dif-of-in-ch06.pdf

¹¹ web.stanford.edu/class/sybsys205/Diffusion%20of%20Innovations.htm

The original diffusion research was done as early as 1903 by the French sociologist Gabriel Tarde. Subsequently in the 1940s, two sociologists, Bryce Ryan and Neal Gross, published their seminal study of the diffusion of hybrid seed among Iowa farmers where they classified the adopter categories as under (their corresponding population-distribution rates are provided alongside) (Table 10.5).

Ryan and Gross found that one of the most important characteristics of the innovators, apart from the fact that they were of higher socioeconomic status than later adopters, is that they required a shorter adoption period than any other category.

Rogers additionally identified several additional characteristics dominant in the various innovation adopter types as follows (Table 10.6).

Rogers breaks the process of adoption of innovation itself broadly down into five stages as follows (Table 10.7).

Table 10.5 Adopter category with distribution rate

S. no.	Adopter category	Population distribution (%)
1	Innovators	2.5
2	Early adopters	13.5
3	Early majority	34
4	Late majority	34
5	Laggards	16

Table 10.6 Adopter characteristics

Adopter category	Characteristics
Innovator	They are venturesome, desire for the rash, the daring and the risky and have control of substantial financial resources that enable them to absorb possible loss from an unprofitable innovation. They also have the ability to understand and apply complex technical knowledge and possess the ability to cope with a high degree of uncertainty associated with an innovation
Early adopters	Aka “opinion leaders”, they are an integrated part of the local social system having the greatest degree of opinion leadership in most systems, serve as role models for other members or the society, are respected by peers for their judicious, well-informed decision-making and are successful people
Early majority	Constituting one-third of the members of a system, they interact frequently with peers seldom holding positions of opinion leadership themselves and mostly deliberate long and hard before adopting a new idea and not going by a mere “hunch”
Late majority	Also constitute one-third of the members of a system who adopt due to pressure from peers and economic necessity and are generally sceptical as well as cautious
Laggard	The constituents of this group possess no opinion leadership, are isolates, have their point of reference in the past, are suspicious of innovations, whose innovation-decision process is lengthy, and have limited resources

Table 10.7 Adoption stages

S. no.	Adoption stage	Description
1	Awareness	The individual is exposed to the innovation but lacks complete information about it
2	Interest	The individual becomes interested in the new idea and seeks additional information about it
3	Evaluation	The individual mentally applies the innovation to his present and anticipated future situation and then decides whether or not to try it
4	Trial	The individual makes full use of the innovation
5	Adoption	The individual decides to continue with the full use of the innovation

When the decisions to adopt are neither authoritative nor collective, each member of the social system faces his own innovation-decision that too follows a five-step process as below:

1. **Knowledge:** the person becomes aware of an innovation and has some idea of how it functions.
2. **Persuasion:** the person forms a favourable, or an unfavourable, attitude towards innovation.
3. **Decision:** the person engages in activities that lead to a choice being adopted or rejected.
4. **Implementation:** the person puts an innovation to use.
5. **Confirmation:** the person evaluates the results of an innovation-decision already made.

Rogers states that people will adopt an innovation if they believe that it will ultimately enhance their utility. They must therefore believe that the innovation is most likely to yield some advantage relative to the idea it aims to supersede. Therefore, the challenge for any innovation to succeed is to convince the key opinion leaders, who are to be found amongst the early adopters, of its overall usefulness. A critical momentum is gained once the early majority use it and get some amongst the late majority to adopt it too. Laggards will however always be there. It is wise to accept and tolerate it irrespective of how galling it is.

Another important point to note is that the most hostile elements turn out to be the biggest champions once successfully convinced. So, concentrating on them early on and convincing them is well worth the effort. No one evangelises better than a converted heretic.